CVT

Chosen Valley Testing

Preliminary Geotechnical Evaluation:

Proposed Site Development
Med Tech Park Subdivision
Red Wing, Minnesota

Prepared for:

Ms. Shari Chorney
Red Wing Port Authority

February 22, 2011
MNR11-2862

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Chosen Valley Testing, Inc.

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February 22, 2011

Re: Preliminary Geotechnical Evaluation
Proposed Site Development
Med Tech Park Subdivision
6th Addition, Lot 1, Block 3
Red Wing, Minnesota
CVT Project Number: MNR11.2862

Dear Ms. Chorney:

As authorized, we have completed the preliminary geotechnical evaluation at the above site in Red Wing, Minnesota. This letter briefly summarizes the findings in the attached report.

Summary of Boring Results

At the surface, the borings encountered about 1 foot of topsoil clay in most areas. The topsoil clay was about 4 feet deep at one location.

The borings were dominated primarily by a mixture of silty sands and gravels. The upper portions of these silty sands and gravels often appeared to be fill materials. The silty sands and gravels that appeared to be fill were met to depths of about 6½ to 18 feet.

Loessal soils consisting of lean clay and sandy silt were observed in the southwest borings. Alluvial sands were met in the central borings.

Natural silty sands and gravels were encountered at depth in most of the borings. Two of the boring terminated in the natural silty sands and gravels at about 21 feet. Most of the remaining borings met weathered dolostone at depths of about 6½ to 18 feet, before terminating on what appears to be intact bedrock.

Groundwater was not recorded in any of the borings, and the majority of the samples recovered were not overly wet. Based on the findings, it appears that the groundwater level at the site is below the depths

reached at the time of our exploration. Elevated soil moisture contents were in a couple of the borings, but appears to be due to the natural drainage divides to the southwest of the project area.

Summary of Analysis and Recommendations

The topsoil materials should be completely removed from below buildings and oversize areas. As just mentioned, these soils were typically about 1 foot deep, but were up to 4 feet deep at one location.

We are unaware of any documentation describing the compactive efforts of the silty sand and gravel fill that exists at the site. Typical practice would be to completely remove fill of unknown compaction and replace these materials with engineered fill. However, the silty sand and gravel fill that exists at the site was found to be granular and generally medium dense. Buried topsoil was not observed at the site, indicating that the site had been stripped of topsoil prior to filling. Based on the findings from the borings, the existing silty sand and gravel fill is expected to have a low risk of unusual settlement. We are of the opinion that the existing silty sand and gravel fill can reasonably be left in place below the building area for the type of structures likely to be constructed at the site. If the fill is left in place, we would suggest re-working the existing fill as needed to provide at least 2 feet of "engineered" fill between the existing fill and the footings or slabs.

Based on the borings, we expect that foundations would likely bear on either the fill or naturally occurring silty sands and gravels. Depending on final grades, below-footing corrections in selected areas may be warranted in order to limit differential settlement between these materials. Based on the boring information and assumed loads, we would expect that below-footing corrections are not likely to exceed 2 feet below foundations, and would be fairly limited laterally. With the assumed foundation loads, we are of the opinion that foundations could likely be designed to exert a bearing pressure on the order of 3,000 psf.

The recommendations provided are preliminary. A design phase geotechnical report should be prepared once specific design information for an actual building is available. Additional soil borings may be beneficial in order to define the geotechnical variations at the actual building location, and to refine our preliminary analysis and recommendations.

Remarks

The attached report provides more details of our findings and analysis. We appreciate the opportunity to serve you. If you have any questions about our report, please feel free to contact us at (507) 281-0968.

Sincerely,
Chosen Valley Testing, Inc.

John N. Haas, EIT
Geotechnical Engineer

Jay Nopola, PE, PG
Geotechnical Engineer

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Preliminary Geotechnical Evaluation
Proposed Site Development
Med Tech Park Subdivision
6th Addition, Lot 1, Block 3
Red Wing, Minnesota

CVT Project Number: MNR11.2862
Date: February 22, 2011

A. Introduction

The intent of this report is to present our findings and describe the means used to collect the data. The data was collected for a specific purpose and may not be suitable for other purposes. We should be consulted before attempting to use the data for other uses. A complete and thorough review of the entire document, including its assumptions and its appendices, should be undertaken immediately upon receipt.

A.1. Purpose

This geotechnical report was prepared to assist planning for the proposed development of the above lot in Red Wing, Minnesota. Our services were authorized by Ms. Shari Chorney of the Red Wing Port Authority.

A.2. Scope

To obtain data for analysis, eight penetration test borings were drilled at the site. The borings were drilled to a depth of about 20 feet or to auger refusal. Our engineering scope consisted of providing a preliminary geotechnical analysis of the soil conditions on the site and their suitability for development.

A.3. Boring Locations

The preferred boring locations were selected by Chosen Valley Testing based on information provided by the Red Wing Port Authority. The Boring Location Sketch in the Appendix shows the approximate boring locations as drilled.

Elevations at the borings were estimated using a laser level. The top nut of the fire hydrant approximately 300 feet east of the cul-de-sac at the end of Technology Drive was used as a benchmark. This benchmark was assigned an elevation of 100 feet.

A.4. Geologic Background

A geotechnical report is based on subsurface data collected for the specific structure or problem. Available geologic data from the region can help interpretation of the data and is briefly summarized in this section.

Geologic maps indicate that the dominant soils in the area are likely colluvial deposits of mixed silts and gravel. These materials may be covered by a thin layer of windblown silt and clay (loess). Bedrock was

expected to be less than 50 feet below the surface. The uppermost bedrock is likely dolostone or shale from the St. Lawrence Formation or Lone Rock Formation.

B. Subsurface Data

The borings were performed using penetration test procedures (Method of Test D1586 of the American Society for Testing and Materials). This procedure allows for the extraction of intact soil specimen from deep in the ground. With this method, a hollow-stem auger is drilled to the desired sampling depth. A 2-inch OD sampling tube is then screwed onto the end of a sampling rod, inserted through the hole in the auger's tip, and then driven into the soil with a 140-pound hammer dropped repeatedly from a height of 30 inches above the sampling rod. The sampler is driven 18 inches into the soil, unless the material is too hard. The samples are generally taken at 2½ to 5-foot intervals. The core of soil obtained was classified and logged by our drilling personnel at the site and a representative portion was then sealed and delivered to our laboratory for further review.

B.1. Strata

At the surface, the borings encountered about 1 foot of topsoil clays. The topsoil clay was about 4 feet deep in Boring B-7, and appeared to include fill materials.

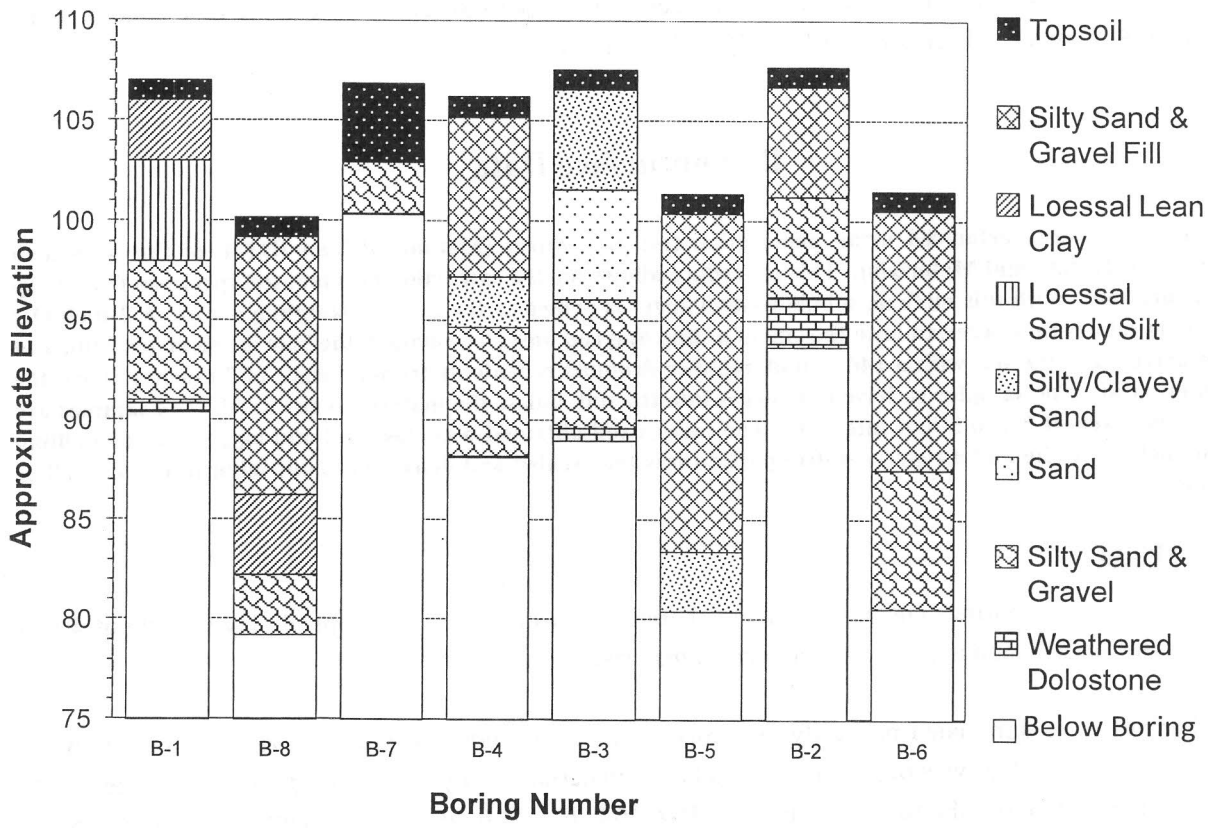
The borings were dominated primarily by a mixture of silty sands and gravels. The upper portions of these silty sands and gravels often appeared to be fill materials. Silty sands and gravels, that appeared to be fill, were met below the topsoil in Borings B-2, B-4, B-5, B-6 and B-8, to depths of about 6½ to 18 feet.

Loessal soils consisting of lean clay and sandy silt were observed in the southwest borings (B-1 and B-8). The loess was met below the topsoil in Boring B-1 to about 9 feet, and below the fill in B-8 to about 18 feet.

Alluvial sands were met in the central borings (B-3, B-4 and B-5). The alluvial sands consisted of both silty to clayey sand, and rather clean sand. These soils were met below the topsoil in Boring B-3 to about 11½ feet, and below the fill in Borings B-4 and B-5 to about 11½ to 21 feet.

Natural silty sands and gravels were encountered in most of the borings. In most of the borings, the natural silty sands and gravels were indicated by their presence below the aforementioned natural soils. In Borings B-2 and B-6, where the fill was directly above the natural silty sands and gravels, the natural soils were distinguished by a more uniform appearance. Borings B-6 and B-8 terminated in the natural silty sands and gravels at about 21 feet. Borings B-1, B-2, B-3, B-4 and B-7 met weathered dolostone at depths of about 6½ to 18 feet, before terminating on what appears to be intact bedrock.

For the reader's convenience, a simplified cross section of the borings is provided below. The borings are presented generally from the southwest to the northeast portion of the site, for ease in interpretation. For more detailed information, please refer to the Log of Boring sheets in the Appendix.



B.2. Penetration Test Results

Penetration Test Results: The number of blows needed for the hammer to advance the penetration test sampler is an indicator of soil characteristics. The results tend to be more meaningful for natural mineral soils, than for fill soils. In fill soils, density tests are more meaningful.

Penetration resistance values ("N" Values) of 12 to 60 Blows per Foot (BPF) were recorded in the silty sand and gravel fill materials, indicating they were somewhat variable but typically medium dense to dense. Values of 6 to 13 Blows per Foot (BPF) was recorded in the loessal lean clay and sandy silt, indicating they were medium to rather stiff or loose to medium dense. The sands and silty/clayey sands returned values of 6 to 22 BPF, indicating they were loose to medium dense. Values of 8 to 50 BPF were recorded in the natural silty sands and gravels, indicating they ranged from loose to very dense, but were most often medium dense to dense. Values of 50 blows for 1 to 3 inches of advancement were recorded in the weathered dolostone, indicating it was very dense and only slightly weathered.

A key to the descriptors used to qualify the relative density of soil (such as soft, stiff, loose, and dense) can be found on the legend to Soil Description in the Appendix.

B.3. Groundwater Data

During drilling, the drillers may note the presence of moisture on the sampler, in the cuttings, or in the

borehole itself. These findings are reported on the Logs of Boring. Because water levels vary with weather, time of year, and other factors, the presence or lack of water during exploration is subject to interpretation and is not always conclusive.

Groundwater was not recorded in any of the borings and the majority of the samples recovered were not overly wet. Based on the findings it appears that the groundwater level at the site is below the depths reached at the time of our exploration. Some elevated moisture contents were observed in the lower sandy silts in Boring B-1, and to a lesser extent in the silty sand and gravel of Boring B-4. This moisture appears to be due to the natural drainage divides to the southwest of the project area.

C. Design Data

Because each structure has a different loading configuration and intensity, different grades, and different structural or performance tolerances, the results of a geotechnical exploration will mean different things for different facilities. If the design of the facility changes, the soils engineer should be contacted to discuss the possible implications of the changes. Without a chance to review such changes, the recommendations of the soils engineer may no longer be valid or appropriate.

Specific building design for the site is not available. General recommendations are desired regarding the potential of the site for development. We expect that the building that would likely occupy the site would consist of a single-story, slab on grade structure consisting of office or warehouse-type buildings. For purposes of analysis, we have anticipated that maximum strip footing loads for such a building would not exceed about 6,000 pounds per foot of wall and column loads would not exceed 150 kips. We have assumed that final grades would remain near the existing grades.

D. Analysis

D.1. Summary of Site Conditions

About 1 foot of topsoil exists across most of the site, with the topsoil up to 4 feet deep at Boring B-7. Silty sand and gravel fill was present in most of the borings to depths of about 6½ to 18 feet below the surface. The natural soils at the site consist primarily of natural silty sand and gravel, with lesser amounts of alluvial sands and loessal silt and clay also encountered. Bedrock was met in most of the borings at depths that ranged from about 6½ to 18 feet. It appeared that the bedrock surface generally sloped from the southeast to the northwest, with an area of higher bedrock in the area of Boring B-7.

D.2. Preliminary Geotechnical Analysis

The topsoil materials should be completely removed from below buildings and oversize areas. As just mentioned, these soils were typically about 1 foot deep, but were up to 4 feet deep at the location of Boring B-7.

We are unaware of any documentation describing the compactive efforts of the silty sand and gravel fill

that exists at the site. Typical practice would be to completely remove fill of unknown compaction and replace these materials with engineered fill. However, the silty sand and gravel fill that exists at the site was found to be granular and generally medium dense. Buried topsoil was not observed at the site, indicating that the site had been stripped of topsoil prior to filling. Based on the findings from the borings, the existing silty sand and gravel fill is expected to have a low risk of unusual settlement. We are of the opinion that most of the existing silty sand and gravel fill can reasonably be left in place below the building area for the type of structures likely to be constructed at the site. If the fill is left in place, we would suggest re-working the existing fill as needed to provide at least 2 feet of "engineered" fill between the existing fill and the footings or slabs.

Based on the borings, we expect that foundations would likely bear on either the fill or naturally occurring silty sands and gravels. Depending on final grades, other materials may present below foundations, including loessal silts and clays, alluvial sands, or possibly intact bedrock. The difference in compressibility between these materials may create a risk of differential settlement. Below-footing corrections in selected areas may be warranted in order to limit differential settlement. Based on the boring information and assumed loads, we would expect that below-footing corrections are not likely to exceed 2 feet below foundations, and would be fairly limited laterally. With the assumed foundation loads, we are of the opinion that foundations could likely be designed to exert a bearing pressure on the order of 3,000 psf.

D.3. Additional Analysis and Exploration

The recommendations provided are preliminary. A design phase geotechnical report should be prepared once specific design information for an actual building is available. Additional soil borings may be beneficial in order to define the geotechnical variations at the actual building location and to refine our preliminary analysis and recommendations.

E. Level of Care

The services provided for this project have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in this area, under similar budget and time constraints. This is our professional responsibility. No other warranty, expressed or implied, is made.

F. Certification

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly registered engineer under the laws of the State of Minnesota.

Jay Nopola, PE , PG
Registration Number 45458
February 22, 2011

Appendix

Boring Location Sketch

Log of Boring # 1- 8

Legend to Soil Description

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Chosen Valley Testing, Inc.

Boring Location Sketch

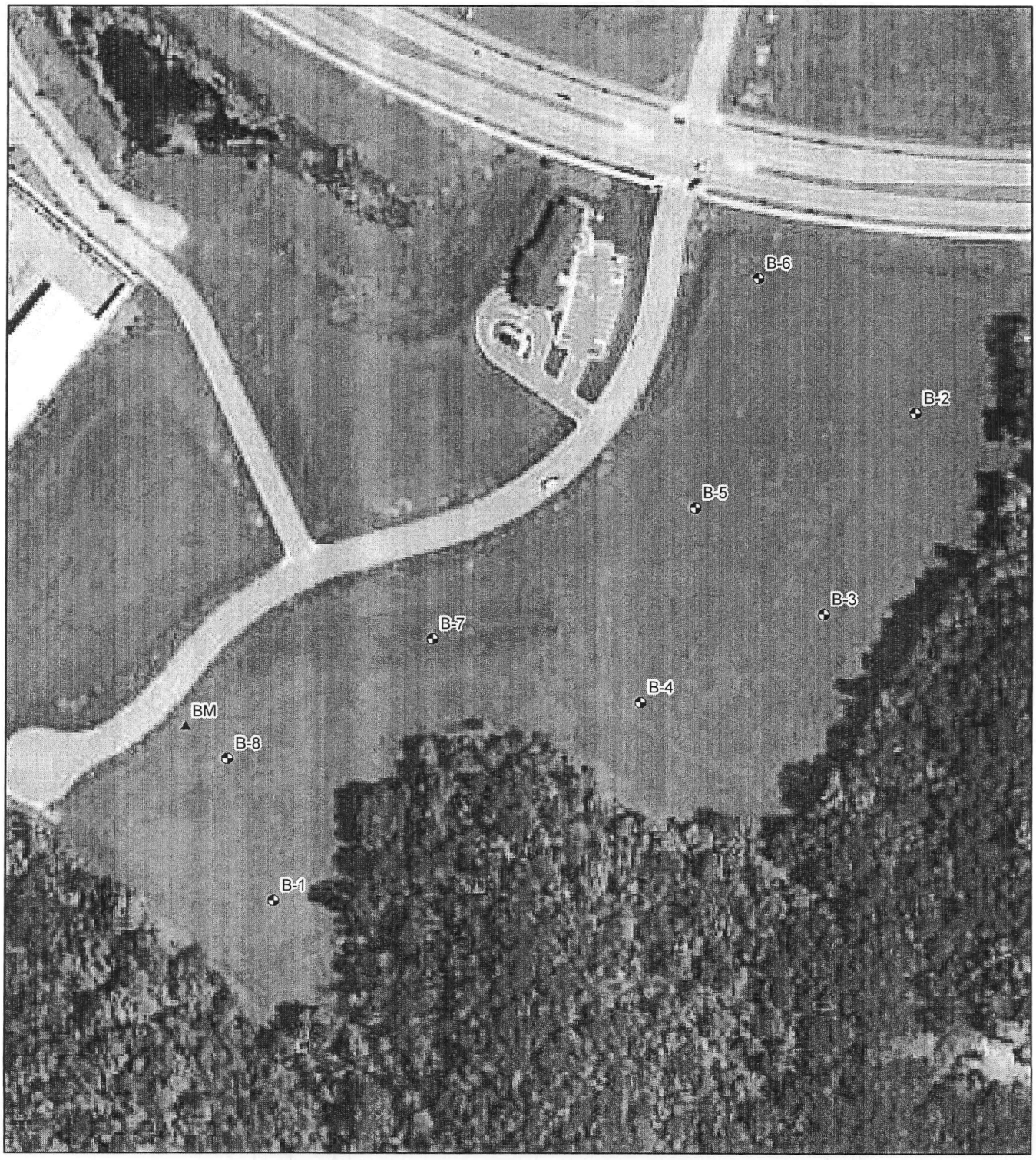
Proposed Site Development
Med Tech Park Subd. 6th Add.
Lot 1, Blk. 3
Red Wing, MN

Legend

- Boring Locations
- Benchmark

N

0 100 200 400 Feet



LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862
Preliminary Geotechnical Evaluation
Proposed Development
Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3
Red Wing, Minnesota

BORING: **B-1**

LOCATION:
See attached sketch.

DATE: 2/3/2011

SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
107.0	0.0					
106.0	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			Benchmark: Top nut of fire hydrant, approximately 300 feet east of cul-de-sac, assigned 100.0 feet.
103.0	4.0	CL	**LEAN CLAY with SAND** brown, wet, medium. (Loess/Possible Fill)	6		
98.0	9.0	ML	**SILT to SANDY SILT** brown, slightly mottled, wet to about 7 feet then very wet, loose to medium dense. (Loess)	13 10	▽	Cave-in at about 8.5 feet after auger withdrawal
91.0	16.0	SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, yellowish brown, wet, loose to dense. (Colluvium/Residuum)	8 36 26		
90.4	16.6		**WEATHERED DOLOSTONE** dolostone fragments recovered, yellowish brown to yellowish gray, moist, very dense. (St. Lawrence Formation)	*		* 50 = 1" (set)
			Auger refusal presumably on intact bedrock. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-2** LOCATION: See attached sketch. DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
107.7	0.0					
106.7	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, dark brown to light brown, moist to wet, medium dense. (Fill)	18		
				26	▽	Cave-in at about 5 feet after auger withdrawal
101.2	6.5					
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, yellowish brown, moist, medium dense to dense. (Colluvium/Residuum)	34		
				19		
96.2	11.5					
			WEATHERED DOLOSTONE dolostone fragments recovered, trace green shale seams, yellowish brown to yellowish gray, moist, very dense. (St. Lawrence Formation)	*		* 50 = 3" (set)
93.7	14.0					
			Auger refusal presumably on intact bedrock. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-3** LOCATION: See attached sketch. DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
107.6	0.0					
106.6	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM SC	**SILTY SAND to CLAYEY SAND** fine to medium-grained, dark brown, moist to wet, loose. (Alluvium)	6		
				6		
101.6	6.0	SP SM	**POORLY GRADED SAND with SILT** fine to medium-grained, brown, moist, loose. (Alluvium)	9		
98.6	9.0	SP	**POORLY GRADED SAND** fine-grained, light brown, moist, loose. (Alluvium)	6		
96.1	11.5	SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, yellowish brown, moist, medium dense to dense. (Colluvium/Residuum)	26		
				31		
89.6	18.0					
89.0	18.6		**WEATHERED DOLOSTONE** dolostone fragments recovered, yellowish brown to yellowish gray, moist, very dense. (St. Lawrence Formation)	*		* 50 = 1" (set)
			Auger refusal presumably on intact bedrock. Boring dry upon completion. Boring sealed upon completion.			

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LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-4** LOCATION: See attached sketch. DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
106.2	0.0					
105.2	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, dark brown to light brown, moist, medium dense to very dense. (Fill)	27 60 12		
97.2	9.0					
		SM	**SILTY SAND** grades to clayey sand, fine to medium-grained, brown, moist, medium dense. (Alluvium)	22		Cave-in at about 9.5 feet after auger withdrawal
94.7	11.5					
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, yellowish brown, moist to about 14 feet then wet, medium dense to dense. (Colluvium/Residuum)	27 13		
88.2	18.0					
88.1	18.1		**WEATHERED DOLOSTONE** dolostone fragments recovered, yellowish brown to yellowish gray, moist, very dense. (St. Lawrence Formation)	*		* 50 = 1" (set)
			Auger refusal presumably on intact bedrock. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-5** LOCATION: See attached sketch. DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
101.4	0.0					
100.4	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, dark brown to light brown, moist to wet, medium dense to dense. (Fill)	19		
				39		
					▽	Cave-in at about 6.7 feet after auger withdrawal
				35		
				27		
				16		
				49		
83.4	18.0					
		SM SC	**SILTY SAND to CLAYEY SAND** fine to medium- grained, brown, moist to wet, medium dense. (Alluvium)	15		
80.4	21.0		End of boring. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-6** LOCATION: See attached sketch. DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
101.5	0.0					
100.5	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, dark brown to light brown, moist to wet, medium dense. (Fill)	16 32		
95.0	6.5					
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, brown to light brown, moist to wet, medium dense. (Fill Colluvium)	25 27 24	▽	Cave-in at about 9.7 feet after auger withdrawal
87.5	14.0					
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, trace shale seams, yellowish brown to yellow, moist, dense. (Colluvium/Residuum)	45 50		
80.5	21.0					
			End of boring. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862
Preliminary Geotechnical Evaluation
Proposed Development
Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3
Red Wing, Minnesota

BORING: **B-7**

LOCATION:
See attached sketch.

DATE: 2/3/2011

SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
106.9	0.0	CL	**Slightly Organic SANDY LEAN CLAY** grades to clayey sand, trace roots, dark brown, moist, rather stiff. (Topsoil/Fill)			
				12	▽	Cave-in at about 2.3 feet after auger withdrawal
102.9	4.0	SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, trace shale seams, yellowish brown, moist, medium dense. (Colluvium/Residuum)	30		
100.4	6.5			*		* 50 = 1" (set)
100.3	6.6		**WEATHERED DOLOSTONE** dolostone fragments recovered, trace green shale seams, yellowish brown to yellowish gray, moist, very dense. (St. Lawrence Formation)			
			Auger refusal presumably on intact bedrock.			
			Boring dry upon completion.			
			Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

LOG OF BORING

CHOSEN VALLEY TESTING **CVT**

PROJECT: MNR11.2862 Preliminary Geotechnical Evaluation Proposed Development Med Tech Park, Subd. 6th Add., Lot 1, Blk. 3 Red Wing, Minnesota	BORING: **B-8** LOCATION: See attached sketch.
	DATE: 2/3/2011 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
100.2	0.0					
99.2	1.0	CL	**Slightly Organic SANDY LEAN CLAY** dark brown, frozen. (Topsoil)			
		SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, trace cobbles, dark brown to yellowish brown, moist to wet, medium dense to dense. (Fill)	28 41 49 37 40	▽	Cave-in at about 12 feet after auger withdrawal
86.2	14.0	CL	**LEAN CLAY** brown, moist to wet, rather stiff. (Loess)	12		
82.2	18.0	SM	**SILTY SAND to SANDY SILT and GRAVEL** dolostone gravel in a silty sand/sandy silt matrix, brown, moist, medium dense to dense. (Colluvium/Residuum)	24		
79.2	21.0		End of boring. Boring dry upon completion. Boring sealed upon completion.			

CVT STANDARD MNR11-2862 (RED WING PORT AUTHORITY).GPJ LOG A GNNN06.GDT 2/22/11

UNIFIED SOIL CLASSIFICATION (ASTM D-2487/2488)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

Relative Proportions of Sand and Gravel

TERM	PERCENT
Trace	< 15
With	15 - 29
Modifier	> 30

Relative Proportions of Fines

TERM	PERCENT
Trace	< 5
With	5 - 12
Modifier	> 12

Grain Size Terminology

TERM	SIZE
Boulder	< 12 in.
Cobble	3 in. - 12 in.
Gravel	#4 sieve to 3 in.
Sand	#200 sieve to #4 sieve
Silt or Clay	Passing #200 sieve

SAMPLE TYPES

Hollow Stem

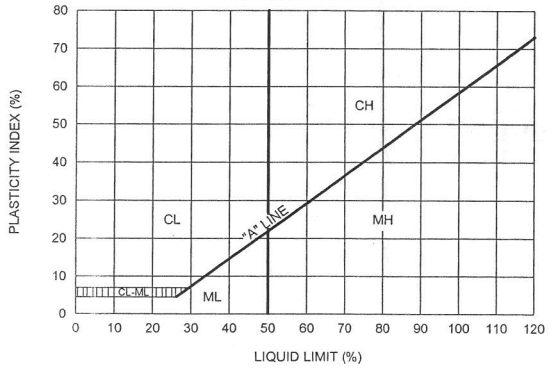
Standard Penetration Test

TEST SYMBOLS

MC	-	MOISTURE CONTENT	LL	-	LIQUID LIMIT
OC	-	ORGANIC CONTENT	PI	-	PLASTISITY INDEX
CN	-	CONSOLIDATION	SW	-	SWELL TEST
DD	-	DRY DENSITY	UU		Unconsolidated Undrained triaxial
PP	-	POCKET PENETROMETER			
RV	-	R-VALUE			
SA	-	SIEVE ANALYSIS			
P200	-	% PASSING #200 SIEVE			

▽ - WATER LEVEL (WITH TIME OF) MEASUREMENT

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 1	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 3	0.25 - 0.50
MEDIUM DENSE	10 - 30	RATHER SOFT MEDIUM	4 - 5 6 - 8	0.50 - 1.0
DENSE	30 - 50	RATHER STIFF STIFF	9 - 12 13 - 16	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	17 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

Chosen Valley Testing

Job No. MNR11.2862

LEGEND TO SOIL DESCRIPTIONS

CVT